

**APPENDIX E**

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**BIOLOGICAL TECHNICAL INFORMATION  
AND DATA SUMMARIES**

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**Draft Environmental Impact Statement  
Allocation of Water Supply and  
Long-Term Contract Execution  
Central Arizona Project**

**E.I. FIELD METHODOLOGY**

Habitat type was assessed for over 1,600 square miles (over one million acres) within the municipal and industrial (M&I) service or municipal planning areas (MPAs). Areas were field surveyed at the rate of 50 square miles per day during December 1999 and January 2000.

To aid in the determination of association types, and to ascertain an estimate of important ecological parameters, a total of 169 sampling sites were established in what appeared to be habitat typical for each specific area. At each sampling site, an initial point was identified by randomly obtained compass bearings and distance units. The number of samples taken was in direct relationship to the size of the total area to be sampled. To estimate foliar height density (fhd) (fhd= horizontal and vertical density of vegetation) live plant material was identified and marked as present or absent within an imaginary vertical cylinder one decimeter in diameter at height intervals of 0-1.5 meters (m), 1.5-1m, 1-2m, 2-3m, 3-4m, and >4m. Secondly, all perennial species were identified within a radius of 3m, and then the distance (up to 500m) to the nearest tree (> 6inches diameter breast height) was estimated for each of four quads. Finally, any additional perennial species visible in the area were recorded. Saguaro density was calculated and ranked into the following categories: 1) **None** = none in sight of plot; 2) **low** = one saguaro per 50 acres or more; 3) **moderate** = one saguaro per 10-50 acres; and 4) **high** = one saguaro per 10 acres or less. The data were averaged within each sampling unit and a determination was done to establish which biotic association each site belonged to.

Habitats were typed at broad association levels as described by Brown (1982) (Table E-1) and with the aid of aerial photographic enlargements (1 inch = 1,200 feet) or with comparable contact prints, were delimited onto clear acetate overlays. Because of the broad area covered, closely related associations were not distinguished. Where possible, vegetation polygons were mapped to an accuracy of approximately 40 acres. In some areas, lines were drawn using best judgment where associations intergraded imperceptibly.

<b>Association (common name)</b>	<b>Association (scientific name)</b>
Bursage/Foothill Paloverde	<i>Ambrosia deltoidea/Cercidium microphyllum</i>
Velvet Mesquite	<i>Prosopis velutina</i>
Jojoba/Mixed Scrub	<i>Simmondsia chinensis/mixed scrub</i>
Creosote-bush	<i>Larrea tridentata</i>
Snakeweed/ Velvet Mesquite	<i>Gutierrezia sarothrae/Prosopis velutina</i>
Blue Paloverde/Desert Ironwood	<i>Cercidium floridum/Olneya tesota</i>
Creosote-bush/Allthorn	<i>Larrea tridentata/Canotia holacantha</i>
Frémont Cottonwood/Goodding Willow	<i>Populus fremontii/Salix gooddingii</i>

Table E-2 is a summary of data from sites within the Bursage-Foothills Paloverde Association. The four parameters include those most important for the assessment of cactus ferruginous pygmy-owl habitat .

<b>M&amp;I</b>	<b>Average FHD Per Site</b>	<b>Percent Frequency Bursage</b>	<b>Percent Frequency Creosote-Bush</b>	<b>Percent Frequency Foothills Paloverde</b>	<b>Average Tree Density Per Acre</b>
City of Peoria	70	72	65	20	4.5
City of Surprise	67	79	47	29	0.8
City of Goodyear	53	20	94	20	2.8
Cave Creek Water Company	70	53	19	31	0.3
City of Phoenix	54	82	54	09	1.0
City of Scottsdale	59	86	30	17	1.3
Arizona Water Company-Apache Junction	53	90	73	18	2.6
Town of Superior/Arizona Water Company Superior	54	87	24	10	3.3
Town of Oro Valley	87	35	23	25	2.2
AVRA Water Cooperative	110	20	90	20	2.6
City of Tucson	98	75	45	21	1.2
Data are for the Bursage/Foothills Paloverde Association (Bureau of Land Management 1999)					

<b>Table E-3</b>	
<b>CAP Allocation Draft EIS</b>	
<b>List of plant species recorded during field surveys</b>	
<b>Scientific Name</b>	<b>Common Name</b>
<i>Abutilon incanum</i>	Indian mallow
<i>Acacia constricta</i>	White thorn acacia
<i>Acacia greggii</i>	Catclaw acacia
<i>Acourtia nana</i>	desert holly
<i>Acourtia wrightii</i>	brown-foot, perezia
<i>Adenophyllum porophylloides</i>	San Felipe dyssodia
<i>Agave chrysantha</i>	golden-flowered century plant
<i>Agave toumeyana</i>	Toumey agave
<i>Aloysia wrightii</i>	Wright's lippia
<i>Ambrosia ambrosioides</i>	canyon ragweed
<i>Ambrosia deltoidea</i>	Bursage
<i>Ambrosia dumosa</i>	white bursage
<i>Argythamnia lanceolata [Ditaxis lanceolata]</i>	lance-leaf ditaxis
<i>Argythamnia neomexicana [Ditaxis neomexicana]</i>	New Mexican ditaxis
<i>Aristida divaricata</i>	poverty three-awn
<i>Aristida purpurea</i>	purple three-awn
<i>Aristida ternipes</i>	spider-grass
<i>Artemisia ludoviciana</i>	Sagebrush, silver wormwood
<i>Atriplex canescens</i>	four-wing saltbush
<i>Atriplex polycarpa</i>	littleleaf saltbush, desert saltbush
<i>Baccharis brachyphylla</i>	short-leaf baccharis
<i>Baccharis salicifolia</i>	Seepwillow
<i>Baccharis sarothroides</i>	desert-broom
<i>Bebbia juncea</i>	sweet-rush bebia, sweetbush
<i>Berberis haematocarpa</i>	red barberry
<i>Bothriochloa barbinodis</i>	cane bluestem
<i>Bouteloua chondrosioides</i>	Sprucetop grama
<i>Bouteloua curtipendula</i>	side-oats grama
<i>Brickellia californica</i>	California brickellbush, pachaba
<i>Brickellia coulteri</i>	Coulter's brickellia
<i>Calliandra eriophylla</i>	fairly-duster
<i>Canotia holocantha</i>	Crucifixion-thorn
<i>Carnegia gigantea</i>	Saguaro
<i>Castela emoryi</i>	Castela
<i>Celtis pallida</i>	desert hackberry
<i>Celtis reticulata</i>	net-leaf hackberry
<i>Cercidium floridum</i>	blue paloverde
<i>Cercidium microphyllum</i>	foothill paloverde
<i>Chilopsis linearis</i>	desert-willow
<i>Clematis drummondii</i>	Arizona virgin's bower
<i>Clematis ligusticifolia</i>	white virgin's bower, pepper-vine
<i>Condalia warnockii</i>	Squawbush
<i>Coryphantha vivipara</i>	Pincushion cactus

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<b>Scientific Name</b>	<b>Common Name</b>
<i>Coursetia microphylla</i>	Rosemary baby bonnets
<i>Cylindropuntia acanthocarpa</i>	Buckhorn cholla
<i>Cylindropuntia arbuscula</i>	pencil cholla
<i>Cylindropuntia bigelovii</i>	teddy-bear cholla
<i>Cylindropuntia fulgida</i>	chain-fruit cholla
<i>Cylindropuntia leptocaulis</i>	desert Christmas cactus
<i>Cylindropuntia leptocaulis x C. spinosior</i>	hybrid cholla
<i>Cylindropuntia ramosissima</i>	diamond cholla
<i>Cylindropuntia spinosior</i>	cane cholla
<i>Cylindropuntia versicolor</i>	staghorn cholla
<i>Cynodon dactylon</i>	Bermuda grass
<i>Dasyilirion wheeleri</i>	desert spoon
<i>Dodonaea viscosa</i>	Hopbush
<i>Echinocereus engelmannii</i>	Engelmann hedge-hog cactus
<i>Echinocereus fasciculatus</i>	hedge-hog cactus
<i>Encelia farinosa</i>	Brittlebush
<i>Encelia frutescens</i>	rayless encelia, green brittlebush
<i>Ephedra fasciculata</i>	Mormon-tea
<i>Ephedra trifurca</i>	longleaf ephedra
<i>Eragrostis lehmanniana</i>	Lehmann lovegrass
<i>Ericameria laricifolia</i>	turpentine bush
<i>Ericameria linearifolia</i>	narrowleaf goldenweed
<i>Eriogonum fasciculatum</i>	California-buckwheat
<i>Eriogonum inflatum</i>	desert-trumpet, bladderstem
<i>Eriogonum wrightii</i>	shrubby-buckwheat, Wright's eriogonum
<i>Erioneuron pilosum [Tridens pilosa]</i>	hairy tridens
<i>Erioneuron pulchellum</i>	fluff grass
<i>Erioneuron pulchellum [Tridens pulchellum]</i>	fluff grass
<i>Eupatorium solidaginifolium</i>	Goldenrod Eupatorium
<i>Ferocactus acanthoides</i>	compass barrel
<i>Ferocactus wislizeni</i>	barrel cactus
<i>Fouquieria splendens</i>	Ocotillo
<i>Galium stellatum</i>	desert bedstraw
<i>Gutierrezia sarothrae</i>	Snakeweed
<i>Heteropogon contortus</i>	tangle-head
<i>Hibiscus denudatus</i>	paleface rosemallow
<i>Hilaria belangeri</i>	curly-mesquite
<i>Hilaria mutica</i>	Tobosa
<i>Hymenoclea monogyra</i>	Burrobush
<i>Hymenoclea salsola</i>	Burrobush, cheese-bush
<i>Hyptis emoryi</i>	desert lavender
<i>Isocoma acradenia</i>	
<i>Isocoma tenuisecta</i>	Burroweed
<i>Janusia gracilis</i>	slender janusia

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<i>Jatropha cardiophylla</i>	Limberbush
<i>Juniperus coahuilensis</i>	Coahuila juniper
<i>Justicia californica</i>	Chuparosa, hummingbird bush
<i>Krameria erecta</i>	purple heather, Pima rhatany
<i>Krameria grayi</i>	white rhatany
<i>Larrea tridentata</i>	creosote-bush
<i>Leptochloa dubia</i>	green sprangletop
<i>Lotus rigidus</i>	wiry lotus, desert rock-pea
<i>Lycium andersonii</i>	Anderson wolfberry
<i>Lycium berlandieri</i>	Berlandier wolfberry
<i>Lycium fremontii</i>	Fremont thornbush
<i>Lycium pallidum</i>	Wolfberry, burial-bush
<i>Malva parviflora</i>	Cheeseweed, little-mallow
<i>Mammillaria microphylla</i>	fishhook cactus
<i>Mimosa biuncifera</i>	cat-claw mimosa
<i>Muhlenbergia porteri</i>	bush muhly
<i>Nicotiana trigonophylla</i>	desert tobacco
<i>Olneya tesota</i>	Ironwood
<i>Opuntia chlorotica</i>	pancake prickly-pear
<i>Opuntia engelmannii</i>	Engelmann prickly-pear
<i>Opuntia engelmannii x O. phaeacantha</i>	hybrid prickly-pear
<i>Opuntia macrorhiza</i>	plains prickly-pear
<i>Opuntia phaeacantha</i>	brown-spined prickly-pear
<i>Parthenium incanum</i>	Mariola
<i>Peniocereus greggii</i>	Arizona queen-of-the-night
<i>Pleuraphis rigida</i>	big galleta
<i>Populus fremontii</i>	Fremont cottonwood
<i>Porophyllum gracile</i>	slender-poreleaf
<i>Prosopis velutina</i>	Velvet mesquite
<i>Psilostrophe cooperi</i>	Paperflower
<i>Quercus turbinella</i>	Scrub oak
<i>Rhus ovata</i>	Sugar sumac, mountain laurel
<i>Salix gooddingii</i>	Goodding black willow
<i>Sarcostemma cynanchoides</i>	Climbing-milkweed
<i>Senna covesii</i>	Desert senna
<i>Setaria macrostachya</i>	Plains bristlegrass
<i>Simmondsia chinensis</i>	Jojoba
<i>Solanum elaeagnifolium</i>	silver nightshade
<i>Sphaeralcea ambigua</i>	Globemallow
<i>Sporobolus contractus</i>	spike dropseed
<i>Stephanomeria pauciflora</i>	Desert-straw
<i>Tamarix chinensis</i>	Tamarisk, salt-cedar
<i>Thamnosma montana</i>	Turpentine broom
<i>Thymophylla acerosa</i>	
<i>Tiquilia canescens</i>	Spreading coldenia

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<i>Tragia nepetifolia</i>	Noseburn, pussy-nettle
<i>Trixis californica</i>	Trixis
<i>Viguiera parishii</i>	Parish viguiera
<i>Yucca baccata</i>	Banana yucca
<i>Yucca elata</i>	soap-tree yucca
<i>Ziziphus obtusifolia</i>	Graythorn

<b>Table E-4</b>	
<b>CAP Allocation Draft EIS</b>	
<b>Common wildlife species associated with the Sonoran Desertscrub Biome<sup>1)</sup></b>	
<b>Common Name</b>	<b>Scientific Name</b>
<b>Reptiles</b>	
Zebra-Tailed Lizard	<i>Callisaurus draconoides</i>
Western Collared Lizard	<i>Crotaphytus collaris baileyi</i>
Tree Lizard	<i>Urosaurus oranatus</i>
Desert Horned Lizard	<i>Phrynosoma platyrhinos calidiarum</i>
Western Whiptail	<i>Cnemidophorus tigris tigris</i>
Gila Monster	<i>Heloderma suspectum cinctum</i>
Coachwhip	<i>Masticophis flagellum picus</i>
Striped Whipsnake	<i>Masticophis taeniatus</i>
Western Patch-Nosed Snake	<i>Salvadora hexalepis hexalepis</i>
Gopher Snake	<i>Pituophis melanoleucus affinis</i>
Common Kingsnake	<i>Lampropeltis getulus californiae</i>
Night Snake	<i>Hypsiglena torquata</i>
Western Diamondback Rattlesnake	<i>Crotalus atrox</i>
<b>Mammals</b>	
Desert Cottontail	<i>Sylvilagus audubonii</i>
Black-tailed Jackrabbit	<i>Lepus californicus</i>
Harris' Antelope Squirrel	<i>Ammospermophilus harrisi</i>
Rock Squirrel	<i>Spermophilus variegatus</i>
Rock Pocket Mouse	<i>Perognathus intermedius</i>
Desert Pocket Mouse	<i>Perognathus penicillatus</i>
Cactus Mouse	<i>Peromyscus eremicus</i>
So. Grasshopper Mouse	<i>Onychomys torridus</i>
White-Throated Woodrat	<i>Neotoma albigula</i>
Coyote	<i>Canis latrans</i>

<b>Table E-4 CAP Allocation Draft EIS Common wildlife species associated with the Sonoran Desertscrub Biome<sup>1)</sup></b>	
<b>Common Name</b>	<b>Scientific Name</b>
Gray Fox	<i>Urocyon cinereoargenteus</i>
Ringtailed Cat	<i>Bassaricus astutus</i>
Badger	<i>Taxidea taxus</i>
Striped Skunk	<i>Mephitis mephitis</i>
Mountain Lion	<i>Felis concolor</i>
Bobcat	<i>Felis rufus</i>
Collard Pecarry	<i>Tayassu tajacu</i>
Desert Mule Deer	<i>Odocoileus hemionus crooki</i>
Sonoran Pronghorn	<i>Antilocapra americana sonorensis</i>
<b>Birds</b>	
Black-chinned Sparrow	<i>Amphispiza bilineata</i>
Burrowing Owl	<i>Athene cunicularia</i>
Cactus Wren	<i>Campylorhynchus brunneicapillus</i>
Costa's Hummingbird	<i>Calypte costae</i>
Curve-billed Thrasher	<i>Toxostoma curvirostra</i>
Elf Owl	<i>Micrathene whitneyi</i>
Gambel's Quail	<i>Lophortyx gambelii</i>
Gila Woodpecker	<i>Melanerpes uropygialis</i>
Harris' Hawk	<i>Parabuteo unicinctus</i>
LeConte's Thrasher	<i>Toxostoma lecontei</i>
Mourning Dove	<i>Zenaidura macroura</i>
Phainopepla	<i>Phainopepla nitens</i>
Roadrunner	<i>Geococcyx californianus</i>
Verdin	<i>Auriparus flaviceps</i>
White-winged Dove	<i>Zenaida asiatica</i>
<sup>1</sup> This table is to provide the reader with species that are <u>typically associated</u> with this Biome (Brown 1982).	

## REFERENCES

- Abbate, D.J., A. Ditty, S. Richardson and R.J. Olding. 1996. Cactus ferruginous pygmy-owl surveys and nest monitoring in the Tucson Basin area, Arizona-1996. Urban Wildlife Enhancement Final Report #U95503. Arizona Game and Fish Department, Phoenix, Arizona.
- Brown, D. E. (ed.) 1982. "Biotic Communities of the American South-United States and Mexico." Desert Plants. Vol. 4. No. 1-4. Boyce Thompson Southwestern Arboretum, Superior, AZ.
- Cody, M.L. (ed.). 1985. Habitat Selection in Birds, Academic Press, Inc., Orlando, FL.
- Gould, Frank W. 1973. Grasses of Southwestern United States, Univ. of Ariz. Press, Tucson, AZ.
- Kearney, T.H. and R.H. Peebles. 1969. Arizona Flora, Univ. of Calif. Press, Berkeley.
- McDougall, W.B. 1973. Seed Plants of Northern Arizona, Museum of Northern Arizona Press, Flagstaff, AZ.
- Rutman, Sue 1992. Handbook of Arizona's Endangered, Threatened, and Candidate Plants. US Fish and Wildlife Service, Phoenix, AZ.
- Southwest Region Species List, 1999. US Fish and Wildlife Service, available on-line: <http://ifw2es.fws.gov/EndangeredSpecies/Lists/default.cfm>, Jan. 6, 2000.
- Wildlife of Special Concern in Arizona, 1996. Nongame Branch of Arizona Game and Fish Department, Phoenix, AZ.